

R E M A R K S

Claims 1 to 13 and 17 to 21 as set forth in Appendix I of this paper are now pending in this case. Claims 5, 7, 10 and 11 have been amended and new Claim 21 has been added as indicated in the listing of the claims.

The Examiner objected to Claims 5 to 11, 19 and 20 as being dependent upon a rejected base claim, and indicated that those claims would be allowable if rewritten in independent form. It is respectfully noted that Claim 8 is in independent form and Claim 20 depends upon Claim 8. Additionally, applicants have amended Claims 10 and 11 to depend upon Claim 8, and Claims 8, 10, 11 and 20 should therefore be in condition for allowance. Further, applicants have amended Claims 5 and 7 to be independent. Claims 6 and 9 depend upon Claim 5 and Claim 19 depends upon Claim 7. Claims 5 to 7, 9 and 19 should therefore also be in condition for allowance. No new matter has been added. Favorable action is respectfully solicited.

New Claim 21 is a reworded version of Claim 1 which further emphasizes that the metal complex which is comprised in the catalyst employed in applicants' hydroformylation process has at least two ligands which each

- have a phosphorus atom, and
- have at least one functional group which is capable of forming intermolecular non-covalent bonds,

and wherein the at least two ligands are dimerized via intermolecular non-covalent bonds which are formed between said functional groups such that the distance between the phosphorus atoms of the dimerized ligands is at most 5 Å.

The Examiner rejected Claims 1 to 4, 12, 13, 17 and 18 under 35 U.S.C. §103(a) as being unpatentable in light of the teaching of *Breikss et al.* (US 5,710,344) when taken in view of the disclosure of *Guram et al.* (6,521,793). The Examiner argued in this context that while the catalyst which is employed in accordance with the hydroformylation process addressed in the teaching of *Breikss et al.* lacked ligands comprising the functional groups which are required in accordance with applicants' invention, a person of ordinary skill in the art would have been motivated to introduce such functional groups because *Guram et al.* disclose catalysts which comprise electron withdrawing or donating groups.

Favorable reconsideration of the Examiner's position is respectfully solicited. As pointed out by the Examiner, the disclosure of *Guram et al.* provides that the electron withdrawing or donating groups of the ligands bind to the metal centers of the metal complex. The ligands addressed in the disclosure of *Guram et al.* are therefore chelate ligands or bidentate ligands, ie. ligands which comprise two groups which coordinate with the metal where both of the coordinating groups are covalently bonded to the same ligand molecule¹. The ligands employed in the catalysts addressed by the teaching of *Breikss et al.* are also bidentate ligands in which two coordinating phosphorus atoms are covalently bonded to one ligand molecule². A person of ordinary skill in the art who modified the bidentate ligands described in the teaching of *Breikss et al.* in view of the bidentate ligands addressed in the disclosure of *Guram et al.* would therefore, at best, have arrived at bidentate ligands in which one of the coordinating phosphorus atoms of the ligands of *Breikss et al.*'s formula (1) was replaced by one of the coordinating electron withdrawing or donating groups which are present in the ligands of *Guram et al.*.

In contrast to the respective structure of such modified chelating ligands in which two coordinating moieties are covalently bonded to one molecule, the ligands which are referenced in applicants' Claims 1 and 21 comprise a coordinating phosphorus atom, and the at least one functional group of the ligands form intermolecular non-covalent bonds between different ligand molecules such that a non-covalently bound ligand dimer or ligand-ligand pair is formed in which the coordinating phosphorus atoms of the different ligands are arranged at a distance of at most 5 Å³. The structural particularities which characterize the metal complex of the catalyst which is employed in accordance with the provisions of applicants' invention are therefore quite different from the structure which would result if the ligands of *Breikss et al.* were

¹ Cf., for example, page 2, indicated lines 4 to 10, of the application. Note also the structural representations in formulae V to VII, col. 2, indicated lines 36 to 59, of *US 66,521,793*.

² Cf., for example, the structural representation of the ligand in formula (1) in col. 2, indicated lines 14 to 19, of *US 5,710,344*.

³ Cf., for example, the schematic illustration of the ligand/ligand pairs set forth on page 8, indicated line 11 et seq., of the application.

modified in light of the disclosure of *Guram et al.* as argued by the Examiner.

It is one of the basic criteria which have to be met in order to establish a *prima facie* case of obviousness that the prior art must provide the person of ordinary skill in the art with some suggestion or motivation to do what the applicant has done⁴. This criterion is not met where the teaching of *Breikss et al.* and the disclosure of *Guram et al.* is concerned because neither one of the references contains anything which would have motivated a person of ordinary skill in the art to turn away from chelating or bidentate ligands which contain two coordinating groups covalently bonded to the same molecule, and to employ ligand-ligand pairs which are formed by non-covalent bonds between functional groups and in which each of the ligands of the ligand-ligand pair contains a coordinating phosphorus atom, particularly since *Breikss et al.* conveys that monodentate ligand systems are disadvantageous and that catalysts comprising them exhibit only a low selectivity⁵. The low selectivity which is exhibited when a metal complex comprising monodentate ligand systems is employed in the hydroformylation of alkenes is, *inter alia*, illustrated by the data set forth in Table 4 on page 35 of the application, which show that at most an n-fraction selectivity of 77% can be achieved, and that the n-fraction selectivity deteriorates to 62%, and the α -fraction selectivity deteriorates from 100% to 93%, when the reaction temperature is increased from 40°C to 125°C. In comparison thereto, the data in Table 3 on page 34 of the application show that the catalysts which are employed in accordance with applicants' process exhibit in the same temperature interval n-fraction selectivities of 93% to 89%, and α -fraction selectivities of 100%.

In light of the foregoing, applicants respectfully disagree with the Examiner's position that the process which is defined in Claim 1 was *prima facie* obvious to a person of ordinary skill in the art from the teaching of *Breikss et al.* when taken in view of the disclosure of *Guram et al.* It is respectfully requested that the rejection under Section 103(a) be withdrawn.

⁴ Cf. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438, 1442 (CAFC 1991)

⁵ Cf., for example, col. 1, indicated lines 30 to 36, of *US 5,710,344*.

Although the foregoing argument essentially focuses on the provisions set forth in Claims 1 and 21, the argument is equally applicable where the subject matter of Claims 2 to 4, 12, 13, 17 and 18 is concerned since these claims depend, either directly or indirectly, upon Claim 1 and therefore incorporate the essential requirements by reference⁶. Favorable action is solicited.

In light of the foregoing and the attached, all claims are deemed to meet the provisions for patentability, and the application should be in condition for allowance. Early action by the Examiner would be greatly appreciated by applicants.

⁶ If an independent claim is non-obvious under 35 U.S.C. §103, then any claim depending therefrom is non-obvious (In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (CAFC 1988)).